UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/770,044 | 02/02/2004 | Dorin Comaniciu | 2003P01633US01 | 9505 |

7590 03/26/2008

Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
Iselin, NJ 08830

| EXAMINER | |
|---|---|
| WONG, ALLEN C | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2621 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 03/26/2008 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/770,044 | COMANICIU ET AL. | |
| | Examiner | Art Unit | |
| | Allen Wong | 2621 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 4-20* is/are rejected.

7)☒ Claim(s) *3* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/2/04, 9/23/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 101*

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 20 is rejected under 35 U.S.C. 101 because claim 20 is directed towards non-statutory subject matter.

The Examiner notes that the term "machine..." as the courts have defined "... includes every mechanical or combination of mechanical device or combination of devices to perform some function and to produce a certain effect or result." *Coming v. Burden, 56 U.S. (15 How.) 252, 267 (1854).* However, the Examiner doesn't believe this lends itself to the modem definition of "computers" which are comprised of processors (elements conducting electrical processes representing complex operations), to arrive at desired computerized results. Accordingly, the Examiner suggests that the term "machine" in the claims be replaced with "computer" in order to fully connote the software based embodiment that is desired by these sets of claims, and in accordance with the *Interim Guidelines, Annex IV (Section c).* The examiner suggests that the preamble of claim 20 be rewritten as “a computer readable medium encoded with computer executable instructions for performing a method for real-time obstacle detection from a vehicle moving relative to a road, comprising:”.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 2, 4, 6-9, 11-17, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stein (6,704,621) in view of Sasaki (6,445,809).

Regarding claim 1, Stein discloses a method for real-time obstacle detection from a vehicle moving relative to a road (col.2, ln.46-53), comprising:

calibrating an image capturing device, such that any image point can be mapped to a real-world point (col.4, ln.40-64, Stein discloses that camera 13 can be calibrated for permitting the mapping of the image data onto the real world three dimensional coordinates);

receiving one or more images from the image capturing device (col.2, ln.36-38);

receiving information about the ego-motion of the image capturing device (col.2, ln.38-44);

selecting one or more real-world points according to a tractability criterion (col.4, ln.43 to col.5, ln.12, Stein discloses that one or more real world points selected according to the probability or tractability criterion); and

applying a motion estimation method on the one or more real-world points, the one or more images, and the known plane to determine an image motion flow of the one or more real-world points (col.2, ln.46-48, col.4, ln.43-col.5, ln.12, Stein discloses

that the ego-motion estimation system processor 14 is used to estimate motion estimation between at least two images (ψ, ψ') in the real world three-dimensional plane to determine the image motion flow, m^ );

determining the true motion flow of the one or more real-world points based on the one or more real world points, the one or more images, and the ego-motion (col.2, ln.46-48, col.4, ln.43-col.5, ln.12, Stein discloses that the ego-motion estimation system processor 14 is used to estimate motion estimation between at least two images (ψ, ψ') to ascertain the ego-motion); and

determining that the one or more real-world points is one or more obstacle points (col.2, ln.46-48, Stein discloses that obstacle detection can be done with Sato's invention, and col.4, ln.43-col.5, ln.12, Stein discloses that real world points are determined).

Stein does not specifically disclose comparing the image motion flow and the true motion flow. However, Sasaki teaches the comparison of optical flows as ascertained for determining whether the driver's vehicle is approaching the front vehicle or object (col.15, ln.53-56, Sasaki discloses the detection of many optical flows, and col.16, ln.66 to col.17, ln.14, numerous optical flows are generated to determine if the driver's vehicle is near the other vehicle or obstacle, and one of the optical flows can be the image motion flow and another optical flow can be true motion flow, and that comparisons of these optical flows are made to determine if the driver's vehicle is near the forward vehicle or obstacle). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Stein and Sasaki, as a whole, for

detecting the presence of surrounding vehicles so as to avoid accidents and collisions (Sasaki col.5, ln.45-49).

Regarding claim 2, Stein discloses wherein applying a motion estimation technique comprises applying an optical flow method with statistical fusion (col.5, ln.31-43 and col.6, ln.14-23, Stein discloses the summation of the values from displacement of points obtained from consecutive images to statistically fuse numerous displacement points).

Regarding claim 4, Stein discloses wherein receiving information about the ego-motion of the image capturing device comprises receiving information from one or more sensors onboard the vehicle (col.2, ln.46-48, col.4, ln.43-col.5, ln.12, Stein discloses that the ego-motion estimation system processor 14 is used to estimate motion estimation between at least two images (ψ, ψ') to ascertain the ego-motion).

Regarding claim 6, Stein discloses wherein receiving information about the ego-motion of the image capturing device comprises determining the information based on the one or more images (col.2, ln.46-48, col.4, ln.43-col.5, ln.12, Stein discloses that the ego-motion estimation system processor 14 is used to estimate motion estimation between at least two images (ψ, ψ') to ascertain the ego-motion).

Regarding claim 7, Stein does not specifically disclose wherein determining that the one or more real-world point is one or more obstacle points by comparing the image motion flow and the true motion flow comprises: if the image motion flow does not match the true motion flow, determining that the one or more real-world points are one or more obstacle points; and if the image motion flow matches the true motion

flow, determining that the one or more real-world points are not obstacle points. However, Sasaki teaches the comparison of optical flows as ascertained for determining whether the driver's vehicle is approaching the front vehicle or object to determine whether the one or more real world points are obstacle points (col.15, ln.53-56, Sasaki discloses the detection of many optical flows, and col.16, ln.66 to col.17, ln.14, numerous optical flows are generated to determine if the driver's vehicle is near the other vehicle or obstacle, and one of the optical flows can be the image motion flow and another optical flow can be true motion flow, and that comparisons of these optical flows are made to determine if the driver's vehicle is near the forward vehicle or obstacle, if so, then the driver will be alerted that there is danger and that the obstacle points are determined). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Stein and Sasaki, as a whole, for detecting the presence of surrounding vehicles so as to avoid accidents and collisions (Sasaki col.5, ln.45-49).

Regarding claims 8 and 16, Stein discloses further comprising: tracking data of a plurality of instances of the one or more obstacle points over a time interval (col.2, ln.46-48, col.4, ln.43-col.5, ln.12, Stein discloses that the ego-motion estimation system processor 14 is used to estimate motion estimation between at least two images ($\psi$, $\psi'$) in that the images are successive or temporally adjacent images corresponding to a time interval); and determining that the one or more obstacle points is one or more actual obstacles based on the data (col.2, ln.46-48, Stein discloses that obstacle

detection can be done with Sato's invention, and col.4, ln.43-col.5, ln.12, Stein discloses that real world points are determined for ascertaining obstacles).

Regarding claim 9, Stein discloses wherein determining that the one or more obstacle points is one or more actual obstacles based on the data comprises determining that the one or more obstacle points is one or more actual obstacles based on the data (col.2, ln.46-48, Stein discloses that obstacle detection can be done with Sato's invention, and col.4, ln.43-col.5, ln.12, Stein discloses that real world points are determined for ascertaining obstacles) and information based on other detection methods (col.2, ln.13-21, fig.2-2A are charts depicting one method of detection, and fig.3 is a second method of detection).

Regarding claim 11, Stein discloses classifying a type of the one or more actual obstacles using automated detection (col.12, ln.45-60, Stein discloses computers can be used for automated detection).

Regarding claim 12, Stein discloses classifying a type of the one or more actual obstacles using a graphical interface (col.12, ln.45-60, Stein discloses computers can be used where the user can use a graphical user interface like a computer).

Regarding claim 13, Stein discloses wherein calibrating the image capturing device comprises calibrating a video camera (col.4, ln.40-64, Stein discloses that camera 13 can be calibrated for permitting the mapping of the image data onto the real world three dimensional coordinates).

Regarding claim 14, claim 14 is met by the same analysis as the rejection for claim 1.

Regarding claim 15, Stein discloses wherein the image capturing device comprises a video camera (col.4, ln.40-64, Stein discloses element 13 is a video camera).

Regarding claim 17, Stein discloses further comprising one or more onboard vehicle sensors for determining the ego-motion of the image capturing device (col.2, ln.46-48, col.4, ln.43-col.5, ln.12, Stein discloses that the ego-motion estimation system processor 14 is used to estimate motion estimation between at least two images (ψ, ψ') to ascertain the ego-motion).

Regarding claim 19, Stein discloses wherein the one or more onboard vehicle sensors comprises a GPS sensor (col.2, ln.51).

Regarding claim 20, claim 20 is met by the same analysis as the rejection for claim 1. In addition, Stein also discloses the use of computer (col.12, ln.45-60).

Claims 5, 10 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stein (6,704,621) and Sasaki (6,445,809) in view of Breed (6,370,475).

Regarding claim 5, Stein discloses wherein receiving information from the one or more sensors comprises receiving information from at least one of a gyro and a GPS (col.2, line 51). Stein and Sasaki do not specifically disclose the use of a gyro. However, Breed discloses the use of the gyro (col.38, ln.3-7). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Stein, Sasaki and Breed, as a whole, for avoiding dangerous, treacherous, unnecessary automobile accidents (col.28, ln.21-29).

Regarding claim 10, Stein discloses wherein determining that the one or more obstacle points is one or more actual obstacles based on the data and information based on other detection methods comprises determining that the one or more obstacle points is one or more actual obstacles based on the data and information (col.2, ln.46-48, Stein discloses that obstacle detection can be done with Sato's invention, and col.4, ln.43-col.5, ln.12, Stein discloses that real world points are determined for ascertaining obstacles; col.2, ln.13-21, fig.2-2A are charts depicting one method of detection, and fig.3 is a second method of detection).

Stein and Sasaki do not specifically disclose based on at least one of radar obstacle detection, lidar obstacle detection, and ultrasonic obstacle detection. However, Breed discloses using at least one of radar obstacle detection (col.26, ln.12-17), lidar obstacle detection (col.26, ln.12-17), and ultrasonic obstacle detection (col.46, ln.6-8). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Stein, Sasaki and Breed, as a whole, for avoiding dangerous, treacherous, unnecessary automobile accidents (col.28, ln.21-29).

Regarding claim 18, Stein and Sasaki do not specifically disclose the use of a gyro. However, Breed discloses the use of the gyro (col.38, ln.3-7). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Stein, Sasaki and Breed, as a whole, for avoiding dangerous, treacherous, unnecessary automobile accidents (col.28, ln.21-29).

***Allowable Subject Matter***

1. Claim 3 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art does not specifically disclose wherein selecting one or more real-world points according to a tractability criterion comprises selecting one or more real-world points according to a tractability criterion inversely proportional with the uncertainty associated with localization of the real-world points.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen Wong whose telephone number is (571) 272-7341. The examiner can normally be reached on Mondays to Thursdays from 8am-6pm Flextime.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John W. Miller can be reached on (571) 272-7353. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you

have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Allen Wong/
Primary Examiner, Art Unit 2621

Allen Wong
Primary Examiner
Art Unit 2621

AW
3/27/08